2. claim 1 was rejected under 35 U.S.C. § 102(e) as being anticipated by U.S. Patent No. 6,303,408 to John W. Smith ("the Smith reference");

3. claims 2 and 3 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Smith in view of U.S. Patent No. 5,767,580 to Rostoker ("Rostoker");

4. claims 4, 7-9, 12-15 and 18 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Smith in view of Applicants' Admitted Prior Art ("AAPA") described with reference to figures 1 and 2;

5. claims 5, 6, 10, 11, 16 and 17 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Smith in view of AAPA as applied to claims 4 and 7 and further in view of Rostoker; and

6. indicated that all claims of the RCE are drawn to the same invention claimed in an earlier application and could have been finally rejected on the grounds and art of record in the next Office action if they had been entered in the earlier application, and made the Office action mailed November 5, 2003 FINAL even though it is a first action in this case.

**Finality of the Office Action mailed November 5, 2003.**

Based on a telephone conversation with the Examiner, it was understood by the undersigned applicant's representative that the Examiner would agree to withdraw the finality of the office action in view of the fact that the claims presented in the instant RCE are not drawn to the same invention claimed in the earlier application. To be sure, the Amendment filed June 3, 2003, amended claims 1-7, 10-12, 16 and 17 and presented new claims 19-36. The amendment to claim 1 introduces claim language not claimed in the earlier application. Accordingly, applicant submits that the making of the Office Action

mailed November 5, 2003, FINAL was premature and respectfully requests the withdrawal of the finality of the rejection.

**Rejection of claims 19-36 under 35 U.S.C. § 112, first paragraph.**

The rejection states:

> Each of the claims contains the limitation "a cavity enclosed by the exterior wall of the solder ball". However, it is physically impossible for the exterior wall to enclose a cavity. Examiner cannot ascertain what feature Applicants intend to claim by this language. Therefore, the claims have not been further treated on the merits.

Claims 19 and 28 are independent claims, and claims 20-27 ultimately depend from claim 19 and claims 29-36 ultimately depend from claim 28. Both claims 19 and 28 recite the claim language "a cavity enclosed by the exterior wall of the solder ball." Applicant respectfully submits that there is nothing physically impossible about the exterior wall of the solder ball enclosing a cavity. The Merriam-Webster dictionary defines the term "wall" as:

> **5** : a material layer enclosing space <the *wall* of a container> <heart *walls*>.

The Merriam-Webster Dictionary, online (www.m-w.com), entry for *wall*.

The use of the term "wall" in claims 19 and 28 fully comports with the common, dictionary definition of the term "wall," i.e., a material layer (*exterior wall of the solder ball*) enclosing a space (*enclosing a cavity*).

Accordingly, applicant respectfully requests favorable reconsideration and withdrawal of the rejection of claims 19-36 under 35 U.S.C. § 112, first paragraph.

As an additional consideration, the present application is a continuation-in-part of parent application Serial No. 09/954,026, filed September 18, 2001, now U.S. Patent No. 6,638,638 B2, issued October 28, 2003. In this parent application, the Examiner's statement of reasons for allowance was that "there is no teaching in the prior art directed to a solder structure that has a cylindrical shape and has a cavity within."

**Rejection of claim 1 under 35 U.S.C. § 102(e).**

Claim 1 was rejected under 35 U.S.C. § 102(e) as being anticipated by U.S. Patent No. 6,303,408 to John W. Smith ("the Smith reference"). Applicant respectfully traverses this rejection. As was discussed during between the undersigned representative and the Examiner during a telephone interview, the present invention is distinguished over the Smith reference because the Smith reference has cores (40) that are spherical and may be entirely solid throughout or may comprise hollow spheres. The rejection states that the Smith reference discloses, *inter alia*:

> wherein the interior cavity is in direct contact with the interior surface of the solder bonding structure ... .

(Office Action mailed November 5, 2003, p. 3, lines 22-23).

To support this assertion, the rejection further states:

> Nowhere in Smith would one of ordinary skill in the art find suggestion that the fusible material is separate in function from the (in this case hollow) core. Therefore, it is an interior surface of this composite structure which defines the "interior cavity". The "solder bonding structure" being the composite conductive element (22).

(Office Action mailed November 5, 2003, p. 6, lines 16-20).

The literal teachings of the Smith reference, however, directly contradicts this assertion. As set forth and argued by applicant in the previous amendment, the Smith reference states:

> The cores may be relatively simply and inexpensive because there is no need for the core to melt during operation; only the thin outer layer of the composite conductive elements must melt in order to provide adequate electrical and thermal interconnections.

(col. 9, lines 3-7).

> The cores desirably have melting temperatures well above the operating temperature range of the microelectronic elements, so that the material constituting the cores remains solid during normal operation.

(col. 3, lines 35-39).

> **As a result of the core, each composite conductive element can be handled and placed even when the fusible material is liquid or molten because surface tension will hold the layer of fusible material around the core. In contrast, when the conductive balls completely comprise [sic] a fusible material, the conductive balls cannot be handled while in a molten or liquid state.**

(col. 9, lines 12-18, *emphasis added*).

> **The spherical cores facilitate movement of the microelectronic elements relative to one another when the conductive material is in a molten condition. ... it is believed that the spherical cores roll on one or both microelectronic elements, and thus act much like miniature bearing balls.**

(col. 3, lines 56-62, *emphasis added*).

This literal teaching of the Smith reference directly and completely contradicts the assertion that "nowhere in Smith would one of ordinary skill in the art find suggestion that the fusible material is separate in function from the (in this case hollow) core."

In fact, the "interior cavity" of the Smith reference can never be in direct contact with the interior surface of the solder bonding structure. The "interior cavity" of the Smith reference is the interior cavity of the cores (40), but only when the cores (40) comprise hollow spheres, and not when entirely solid throughout. As such, the interior cavity of the Smith reference can only be in direct contact with the interior surface of the cores (40) and can never be in direct contact with the interior surface of the solder bonding structure. Put another way, it is the exterior surface of the cores that are always in direct contact with the interior surface of the solder bonding structure. It is a difference between having vs. not having cores (40), but then only hollow cores. As further distinction, without cores (40) in the hollow form, there would be no interior cavity *per se* in the Smith reference. The Smith reference uses these cores (40) as miniature bearing balls to facilitate movement of boards relative to each other when the solder is in a molten state. As was explained, the present invention has no such miniature bearing balls or cores, and the function of the interior cavity in the present invention is to form thin exterior walls in the solder bonding structures to impart resiliency and flexibility to the exterior walls of the solder bonding structures.

In summary, the Smith reference does not teach nor suggest at least an interior cavity in direct contact with the interior surface of the solder bonding structure as claimed

in claim 1. Accordingly, applicant respectfully requests favorable reconsideration and withdrawal of the rejection of claim 1 under 35 U.S.C. § 102(e).

**Rejection of claims 2 and 3 under 35 U.S.C. § 103(a).**

Claims 2 and 3 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Smith in view of U.S. Patent No. 5,767,580 to Rostoker ("Rostoker") on the basis that while the Smith reference as applied to claim 1 describes the claimed invention except the shape of the pads, Rostoker teaches to form pads in either annular or circular shapes. Applicant respectfully traverses this rejection.

Claims 2 and 3 depend from claim 1. As such the application of the Smith reference to claims 2 and 3 under this rejection is the same as the application of the Smith reference to claim 1. Applicant submits that for the same reasons that claim 1 is distinguished and allowable over the Smith reference, claims 2 and 3 distinguish over the Smith reference regardless of the teachings of Rostoker. Accordingly, applicant respectfully requests favorable reconsideration and withdrawal of the rejection of claims 2 and 3 under 35 U.S.C. § 103(a).

**Rejection of claims 4, 7-9, 12-15 and 18 under 35 U.S.C. § 103(a).**

Claims 4, 7-9, 12-15 and 18 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Smith in view of Applicants' Admitted Prior Art ("AAPA") described with reference to figures 1 and 2 on the basis that while the Smith reference as applied to claim 1 describes the claimed invention except specifically state that the invention is a BGA, the AAPA provides evidence that it would have been obvious to use a BGA as it was well known in the art to package chips in BGAs. Applicant respectfully traverses this rejection.

Claims 4, 7 and 12 are all independent claims that share a common limitation with claim 1, namely, the claim limitation, "the interior cavity is in direct contact with the

interior surface of the solder [bonding/ball] structure". As such the application of the Smith reference to claims 4, 7 and 12 under this rejection is the same as the application of the Smith reference to claim 1. Applicant submits that for the same reasons that claim 1 is distinguished and allowable over the Smith reference, claims 4, 7 and 12 distinguish over the Smith reference regardless of the teachings of the AAPA. Accordingly, applicant respectfully requests favorable reconsideration and withdrawal of the rejection of claims 4, 7-9, 12-15 and 18 under 35 U.S.C. § 103(a).

**Rejection of claims 5, 6, 10, 11, 16 and 17 under 35 U.S.C. § 103(a).**

Claims 5, 6, 10, 11, 16 and 17 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Smith in view of AAPA as applied to claims 4 and 7 and further in view of Rostoker on the basis that while the Smith reference and the AAPA as applied to claims 4, 7-9, 12-15 and 18 describes the claimed invention except the shape of the pads, Rostoker teaches to form pads in either annular or circular shapes. Applicant respectfully traverses this rejection.

Claims 5 and 6 depend from claim 4; claims 10 and 11 depend from claim 7, and claims 16 and 17 depend from claim 12. As such the application of the Smith reference to claims 5, 6, 10, 11, 16 and 17 under this rejection is the same as the application of the Smith reference and the AAPA to claims 4, 7 and 12. Applicant submits that for the same reasons that claim 4, 7 and 12 are distinguished and allowable over the Smith reference and the AAPA, claims 5, 6, 10, 11, 16 and 17 distinguish over the Smith reference and the AAPA regardless of the teachings of Rostoker. Accordingly, applicant respectfully requests favorable reconsideration and withdrawal of the rejection of claims 5, 6, 10, 11, 16 and 17 under 35 U.S.C. § 103(a).